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10/099,691	03/14/2002	Knut S. Grimsrud	ITL.0808US (P14231)	4925

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EXAMINER

TRUONG, BAO Q

ART UNIT	PAPER NUMBER
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2187

DATE MAILED: 08/05/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

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**Office Action Summary**

Application No.

10/099,691

Applicant(s)

GRIMSRUD ET AL.

Examiner

Bao Q Truong

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 20 May 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-11, 13-15 and 17-56 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 15, 17 and 18 is/are allowed.
- 6) ☒ Claim(s) 1, 6-10, 13, 14, 19, 20, 25, 26, 29, 31-35, 39-43, 49, 51-53, 55 and 56 is/are rejected.
- 7) ☒ Claim(s) 2-5, 11, 21-24, 27, 28, 30, 36-38, 44-48, 50 and 54 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 March 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

***Response to Amendment***

1. The examiner acknowledges the applicant's submission of Amendment for Application No. 10/099,691 dated on 20 May 2004. At this point, claims 12 and 16 have been cancelled; claims 13, 15, 17-18, 50, and 54 have been amended. There are 54 claims pending in the application; there are 8 independent claims and 46 dependent claims, all of which are ready for reconsideration by the examiner.

***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1, 10, 19-20, 25-26, 29, 31, 35, 39-43, 49, 51-53, and 55-56 are rejected under 35 U.S.C. 102(b) as being anticipated by Macon, Jr. et al. (U.S. Patent No. 5,410,653).

Referring to claim 1, Macon discloses an apparatus comprising:

a data requestor which has the ability to specify demand data that it wants and to receive reply data including the demand data and optionally also unspecified prefetch data as a CPU for issuing demand address (DADDR) to a file system (see figure 1: element 2 and column 4: lines 59-63) and obtaining both demand data block and read-ahead (prefetch) data blocks at a disk cache (see figure 1: element 7; Abstract; and column 4: lines 12-16);

a communication link (see figures 1 & 3: element 6); and

a data source coupled to the data requestor over the communication link and which has the ability to determine which prefetch data to send to the data requestor with the demand data as a file system and a corresponding disk drive for reading demanded data and prefetching one or more data blocks (see figures 1 & 3: element 10; Abstract; column 2: lines 17-25; and column 5: lines 39-41 and lines 49-56).

As to claim 10, Macon further discloses that the prefetch data are stored contiguously with the demand data in a storage device of the data source (see figure 2A, Abstract, column 3: lines 33-37, and column 6: lines 59-68).

Referring to claim 19, Macon discloses a storage driver for execution by a data requestor to retrieve demand data from a storage system, the storage driver comprising:

means for identifying the demand data to the storage system as a CPU for issuing demand address (DADDR) to a file system (see figure 1: element 2 and column 4: lines 59-63);

means for receiving reply data from the storage system, in which the reply data includes the demand data and potentially also prefetch data which was not identified by the storage driver

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as obtaining both demand data block and read-ahead (prefetch) data blocks at a disk cache (see figure 1: element 7; Abstract; and column 4: lines 12-16);

means for selectively retrieving the demand data out of the reply data as providing addresses associated with blocks of data within the disk cache (see column 5: lines 12-16 and column 7: lines 13-16).

As to claim 20, Macon further discloses:

means for selectively retrieving the prefetch data out of the reply data as providing addresses associated with blocks of data within the disk cache (see column 5: lines 12-16 and column 7: lines 13-16); and

means for caching the prefetch data as the disk cache (see figure 1 and 3: element 7 and column 6: lines 20-24).

Referring to claim 25, Macon teaches a method comprising:

a driver requesting specified demand data from a storage system as a CPU for issuing demand address (DADDR) to a file system (see figure 1: element 2 and column 4: lines 59-63);

the storage system determining which prefetch data to include with the demand data as a file system and a corresponding disk drive for reading demanded data and prefetching one or more data blocks (see figures 1 & 3: element 10; Abstract; column 2: lines 17-25; and column 5: lines 39-41 and lines 49-56); and

the driver receiving, from the storage system, the demand data and the prefetch data as obtaining both demand data block (see figure 6: step N and column 6: lines 59-68) and read-

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ahead (prefetch) data blocks (see figure 6: step G and column 6: lines 59-68) at a disk cache where the CPU can access (see figure 1: element 7).

As to claim 26, Macon further teaches the storage system determining which prefetch data to include, based at least in part on a state of the storage system as the state whether the read-ahead data blocks are consecutive with (after) the demand data block (see figure 2A and column 6: lines 59-68).

As to claim 29, Macon further teaches the driver receiving from the storage system information identifying where, within reply data that includes the demand data and the prefetch data, the demand data is located as providing addresses associated with blocks of data within the disk cache (see column 5: lines 12-16 and column 7: lines 13-16).

As to claim 31, Macon further teaches that the driver and the storage system are connected by communication link (see figure 1: element 6).

Referring to claim 35, Macon teaches a method of operating a storage device driver in a processor-based system which includes a storage system, the method comprising:

receiving a first request for demand data as receiving a demand address (DADDR) from a CPU (see figure 6: step A and column 5: lines 57-59);

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sending a second request for the demand data to the storage system as a file system issuing I/O process to read demanded data block (see figure 6: step N and column 6: lines 59-68) and read-ahead data blocks (see figure 6: step G and column 6: lines 59-68);

receiving reply data from the storage system as receiving both demand data block and read-ahead data blocks at disk cache (see column 6: lines 59-68);

receiving identifying data from the storage system as receiving addresses associated with blocks of data within the disk cache (see column 5: lines 12-16 and column 7: lines 13-16); and

using the identifying data to selectively retrieve the demand data from the reply data as using addresses associated with block of data within the disk cache to return demanded data to the CPU (see column 5: lines 12-16 and column 7: lines 13-16).

As to claim 39, Macon further teaches that the reply data comprises prefetch data and the demand data as obtaining both demand data block and read-ahead (prefetch) data blocks (see Abstract, column 2: lines 17-25, and column 3: lines 25-37).

As to claim 40, Macon further teaches that the demand data and the prefetch data are from contiguous areas of storage (see figure 2A, Abstract, column 3: lines 33-37, and column 6: lines 59-68).

As to claim 41, Macon further teaches that the demand data and the prefetch data are from discontinuous areas of storage (see figure 2C, Abstract, column 3: lines 37-45, column 6: line 68, and column 7: lines 1-5).

Referring to claim 42, Macon teaches a method of operating a storage system in conjunction with a data requestor which does not specify how much prefetch data the storage system should return with demand data requested by the data requestor as a CPU for issuing demand address (DADDR) to a file system (see figure 1: element 2 and column 4: lines 59-63), the method comprising:

- sending the demand data to the data requestor as a file system issuing I/O process to read and return demanded data block to the CPU (see figure 6: step N and column 6: lines 59-68);

- determining what prefetch data to include with the demand data as anticipating, in a file system, a sequential data access and determining which data blocks to be prefetch (see figure 1: element 4, Abstract, column 2: lines 17-25, and column 4: lines 24-30);

- sending the prefetch data to the data requestor as prefetching read-ahead data blocks in to a disk cache where the CPU can access (see figure 6: step G and column 6: lines 59-68);

- providing identifying data to enable the data requestor to discern the demand data from the prefetch data as providing addresses associated with blocks of data within the disk cache (see column 5: lines 12-16 and column 7: lines 13-16).

As to claim 43, Macon further teaches the determining what prefetch data to include comprises basing the determination at least in part on a state of the storage system as the state whether the read-ahead data blocks are consecutive with (after) the demand data block (see figure 2A and column 6: lines 59-68).



As to claim 49 and 51-52, Macon teaches the method of claim 35 in a computer environment. Inherently, the method of claim 35 can be implemented as instructions stored on a machine-accessible medium comprising a recordable storage medium, a carrier wave.

As to claim 53 and 55-56, Macon teaches the method of claim 42 in a computer environment. Inherently, the method of claim 35 can be implemented as instructions stored on a machine-accessible medium comprising a recordable storage medium, a carrier wave.

4. Claims 13-14 are rejected under 35 U.S.C. 102(e) as being anticipated by Bates, Jr. et al. (U.S. Patent No. 6,633,957 B2).

Referring to claim 13, Bates discloses a storage system for responding to a demand data request from a data requestor, the storage system comprising:

- a controller for performing logic operations of the storage system (see figure 1: element 10);

- a storage drive coupled to the controller (see figure 1: element 18);

- a storage cache coupled to the controller (see figure 1: element 24); and

- at least one prefetch algorithm executable by the controller to determine, which prefetch data to include with demand data in a response to the demand data request, and to retrieve the prefetch data and the demand data from at least one of the storage drive and the storage cache, and to provide to the data requestor reply data including the prefetch data and the demand data (see figures 2A-B, 3; column 5: lines 26-67; and column 6: lines 1-20), wherein

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the storage device comprises a rotating storage device (see figure 1: element 18 and column 2: lines 41-44); and

the at least one prefetch algorithm includes the ability to utilize a rotation state of the rotating storage device in determining which prefetch data to include with the demand data in the response as utilizing the state whether the prefetch data blocks are consecutive with (after) the demand data blocks (see figure 2A-B: event E2 and column 3: lines 27-33).

As to claim 14, Bates further discloses that

the rotation state includes whether the prefetch data will arrive at a read head of the rotating storage device after the demand data as utilizing the state whether the prefetch data blocks are consecutive with (after) the demand data blocks (see figure 2A-B: event E2 and column 3: lines 27-33).

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 6-9 and 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Macon, Jr. et al. (U.S. Patent No. 5,410,653) in view of Okayasu (U.S. Patent No. 6,449,696 B2).

As to claims 6-9, Macon discloses the apparatus of claim 1 above. However, Macon does not clearly disclose that the communication link comprises a local area network as in claim 6, a wide area network as in claim 7, the Internet as in claim 8, a host disk controller as in claim 9.

Okayasu discloses an apparatus similar to that of Macon (see Abstract and Summary of The Invention). Okayasu further discloses that the communication link, over which the data source coupled to the data requestor, comprises a local area network (see figure 1: element 4 and column 7: lines 27-38), a wide area network (see figure 1: elements 7-8 and column 7: lines 27-38), the Internet (see figure 1: element 6 and column 7: lines 27-38), a host disk controller (see figure 2: element 16 and column 7: lines 39-46).

It would have been obvious to one having an ordinary level of skill in the art at the time the invention was made to modify the apparatus disclosed by Macon so that the communication link comprises a local area network, a wide area network, the Internet, a host disk controller.

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This would have been obvious because Macon clearly teaches that prefetching is known as disk access avoidance technique that obtains a set of data blocks in a high-speed cache memory with the expectation that some or all of these blocks will subsequently be requested (see column 1: lines 14-19 of Macon). Therefore, prefetching is useful not only locally on a single PC - disk drive system, where a host disk controller is implemented as a communication link, but also across local area network or extended network (see figure 1 of Okayasu).

As to claims 32-34, Macon teaches the method of claim 31 above. Macon further teaches that the method is performed by a computer system, the driver is executed by a microprocessor of the computer system, and the storage system comprises a disk drive system of the computer system (see figures 1 and 3, and column 4: lines 9-30). However, Macon does not clearly disclose that the communication link comprises the Internet as in claim 32, a local area network as in claim 33, and a host disk controller interface to the storage system and in claim 34.

Okayasu teaches a method similar to that of Macon (see Abstract and Summary of The Invention). Okayasu further teaches that the communication link, over which the data source coupled to the data requestor, comprises the Internet (see figure 1: element 6 and column 7: lines 27-38), a local area network (see figure 1: element 4 and column 7: lines 27-38), and a host disk controller (see figure 2: element 16 and column 7: lines 39-46).

It would have been obvious to one having an ordinary level of skill in the art at the time the invention was made to modify the method taught by Macon so that the communication link comprises the Internet, a local area network. This would have been obvious because Macon clearly teaches that prefetching is known as disk access avoidance technique that obtains a set of

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data blocks in a high-speed cache memory with the expectation that some or all of these blocks will subsequently be requested (see column 1: lines 14-19 of Macon). Therefore, prefetching is useful not only locally on a single PC - disk drive system, where a host disk controller is implemented as a communication link, but also across local area network or extended network (see figure 1 of Okayasu).

*Response to Arguments*

7. Applicant's arguments, filed on 20 May 2004, with respect to claims 1, 19, 25, 35, and 42 have been considered but are moot in view of the new ground(s) of rejection.

Because the examiner has issued a new ground(s) of rejection not necessitated by amendment, the present Office Action represents a NON-FINAL Action.

8. Applicant's arguments, filed on 20 May 2004, with respect to claims 11 and 15 have been fully considered and are persuasive. The rejections of claims 11 and 15 have been withdrawn.

9. Applicant's arguments, filed on 20 May 2004, with respect to claims 13-14 have been fully considered but they are not persuasive.

With respect to claims 13-14, the applicant argues on page 14 that Bates does not teach "one prefetch algorithm includes the ability to utilize a rotation state of the rotating storage device in determining which prefetch data to include with the demand data" as in claim 13 and "the rotation state includes whether the prefetch data will arrive at a read head of the rotating storage drive after the demand data" as in claim 14. The examiner disagrees and directs the

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applicant, once again, to figure 2A-B: event E2 and column 3: lines 27-33. At the time of event E2 in figure 2, the CPU (figure 1: element 14) requests for records in unit one of the storage devices starting at block address 213 and having a length of 3 blocks. The storage system controller (figure 1: element 10) triggers a prefetch operation to prefetch blocks 216-218 after reading blocks 213-215. Blocks 216-218 arrive after blocks 213-215. Clearly Bates teaches the above-mentioned limitations of claims 13-14.

***Allowable Subject Matter***

10. Claims 15 and 17-18 are allowed.

11. Claims 2-5, 11, 21-24, 27-28, 30, 36-38, 44-48, 50, and 54 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

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***Conclusion***

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bao Q Truong whose telephone number is (703) 308-7090. The examiner can normally be reached on Monday-Friday from 8:30 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Donald A Sparks, can be reached on (703) 308-1756. The fax phone number for the organization where this application or proceeding is assigned is (703) 746-7239.

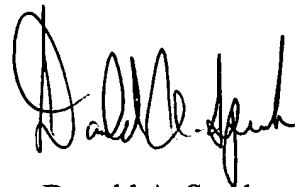
Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

*Bao Q Truong*

BT

Patent Examiner

28 July 2004



Donald A. Sparks

Supervisory Patent Examiner

Technology Center 2100